FIG.1

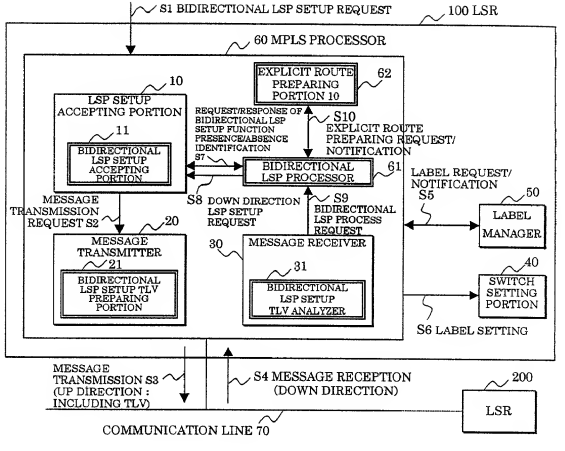
S1 BIDIRECTIONAL LSP SETUP REQUEST
100 LSR
60 MPLS PROCESSOR
EXPLICIT ROUTE PREPARING PORTION 10
62
10
LSP SETUP ACCEPTING PORTION
11
BIDIRECTIONAL LSP SETUP ACCEPTING PORTION
REQUEST/RESPONSE OF BIDIRECTIONAL LSP SETUP FUNCTION PRESENCE/ABSENCE IDENTIFICATION
S10
EXPLICIT ROUTE PREPARING REQUEST/ NOTIFICATION
S7
BIDIRECTIONAL LSP PROCESSOR
61
LABEL REQUEST/ NOTIFICATION
S5
50
LABEL MANAGER
MESSAGE TRANSMISSION REQUEST S2
S8 DOWN DIRECTION LSP SETUP REQUEST
S9
BIDIRECTIONAL LSP PROCESS REQUEST
20
MESSAGE TRANSMITTER
21
BIDIRECTIONAL LSP SETUP TLV PREPARING PORTION
30
MESSAGE RECEIVER
31
BIDIRECTIONAL LSP SETUP TLV ANALYZER
40
SWITCH SETTING PORTION
S6 LABEL SETTING
MESSAGE TRANSMISSION S3 (UP DIRECTION : INCLUDING TLV)
S4 MESSAGE RECEPTION (DOWN DIRECTION)
200
LSR
COMMUNICATION LINE 70

FIG.2

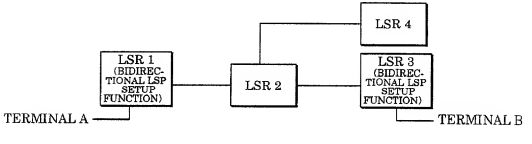
LSR 4
LSR 1 (BIDIRECTIONAL LSP SETUP FUNCTION)
LSR 2
LSR 3 (BIDIRECTIONAL LSP SETUP FUNCTION)
TERMINAL A
TERMINAL B

FIG.3

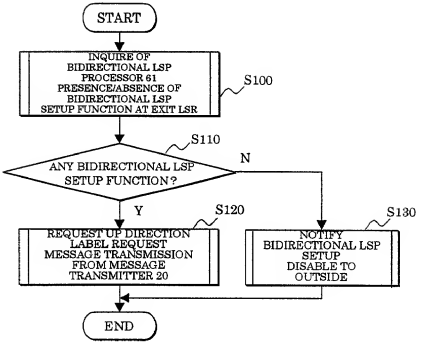

FIG.4

TABLE FOR LSR WITHOUT BIDIRECTIONAL LSP SETUP FUNCTION
LSR 2
LSR 4

FIG.5

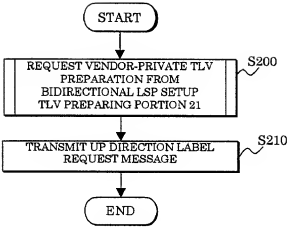
START
REQUEST VENDOR-PRIVATE TLV PREPARATION FROM BIDIRECTIONAL LSP SETUP TLV PREPARING PORTION 21
S200
TRANSMIT UP DIRECTION LABEL REQUEST MESSAGE
S210
END

FIG.6

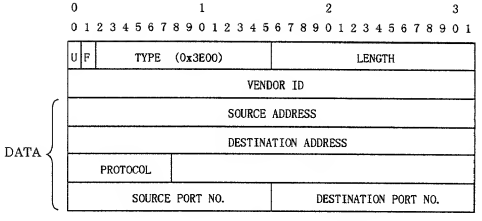
0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
U
F
TYPE (0x3E00)
LENGTH
VENDOR ID
SOURCE ADDRESS
DESTINATION ADDRESS
DATA
PROTOCOL
SOURCE PORT NO.
DESTINATION PORT NO.

FIG.7

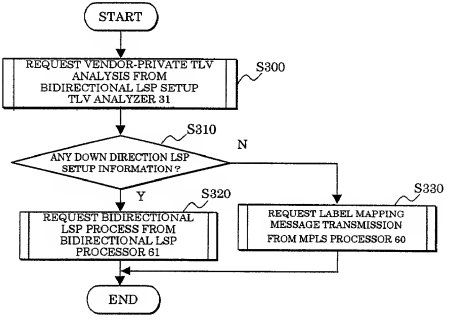
START
REQUEST VENDOR-PRIVATE TLV ANALYSIS FROM BIDIRECTIONAL LSP SETUP TLV ANALYZER 31
S300
S310
ANY DOWN DIRECTION LSP SETUP INFORMATION ?
N
Y
S320
REQUEST BIDIRECTIONAL LSP PROCESS FROM BIDIRECTIONAL LSP PROCESSOR 61
S330
REQUEST LABEL MAPPING MESSAGE TRANSMISSION FROM MPLS PROCESSOR 60
END

FIG.8

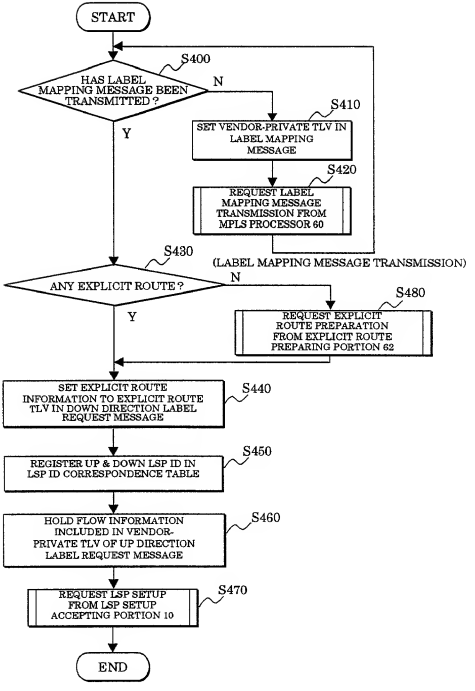
START
S400
HAS LABEL MAPPING MESSAGE BEEN TRANSMITTED ?
N
Y
S410
SET VENDOR-PRIVATE TLV IN LABEL MAPPING MESSAGE
S420
REQUEST LABEL MAPPING MESSAGE TRANSMISSION FROM MPLS PROCESSOR 60
(LABEL MAPPING MESSAGE TRANSMISSION)
S430
ANY EXPLICIT ROUTE ?
N
Y
S480
REQUEST EXPLICIT ROUTE PREPARATION FROM EXPLICIT ROUTE PREPARING PORTION 62
SET EXPLICIT ROUTE INFORMATION TO EXPLICIT ROUTE TLV IN DOWN DIRECTION LABEL REQUEST MESSAGE
S440
REGISTER UP & DOWN LSP ID IN LSP ID CORRESPONDENCE TABLE
S450
HOLD FLOW INFORMATION INCLUDED IN VENDOR-PRIVATE TLV OF UP DIRECTION LABEL REQUEST MESSAGE
S460
REQUEST LSP SETUP FROM LSP SETUP ACCEPTING PORTION 10
S470
END

FIG.9

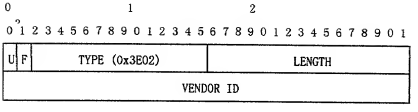

FIG.10

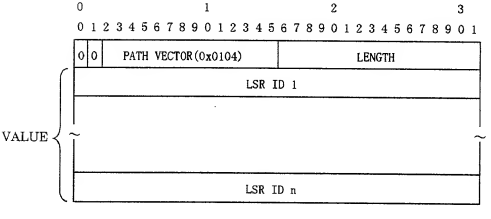

FIG.11

UP DIRECTION LSP ID	DOWN DIRECTION LSP ID
1	2

FIG.12

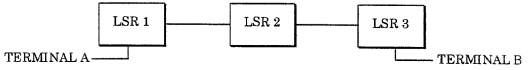
LSR 1
LSR 2
LSR 3
TERMINAL A
TERMINAL B

FIG.13

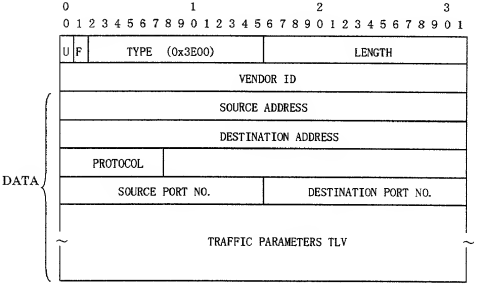
0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
U
F
TYPE (0x3E00)
LENGTH
VENDOR ID
SOURCE ADDRESS
DESTINATION ADDRESS
PROTOCOL
SOURCE PORT NO.
DESTINATION PORT NO.
DATA
TRAFFIC PARAMETERS TLV

FIG.14

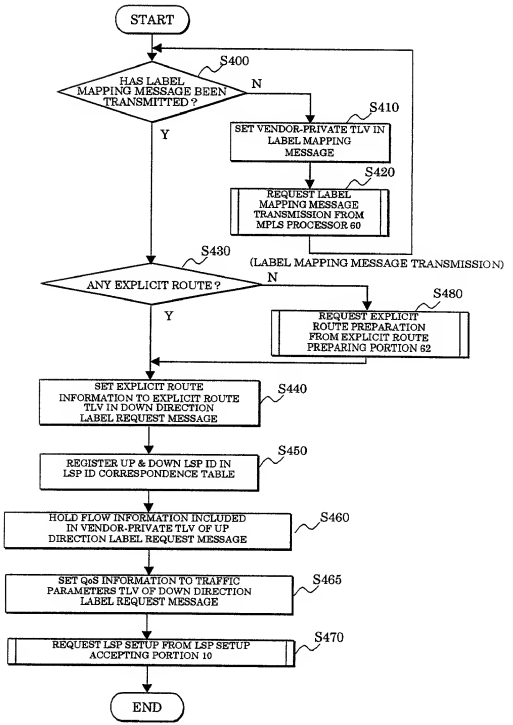
START
S400
HAS LABEL MAPPING MESSAGE BEEN TRANSMITTED ?
N
Y
S410
SET VENDOR-PRIVATE TLV IN LABEL MAPPING MESSAGE
S420
REQUEST LABEL MAPPING MESSAGE TRANSMISSION FROM MPLS PROCESSOR 60
(LABEL MAPPING MESSAGE TRANSMISSION)
S430
ANY EXPLICIT ROUTE ?
N
Y
S480
REQUEST EXPLICIT ROUTE PREPARATION FROM EXPLICIT ROUTE PREPARING PORTION 62
SET EXPLICIT ROUTE INFORMATION TO EXPLICIT ROUTE TLV IN DOWN DIRECTION LABEL REQUEST MESSAGE
S440
REGISTER UP & DOWN LSP ID IN LSP ID CORRESPONDENCE TABLE
S450
HOLD FLOW INFORMATION INCLUDED IN VENDOR-PRIVATE TLV OF UP DIRECTION LABEL REQUEST MESSAGE
S460
SET QoS INFORMATION TO TRAFFIC PARAMETERS TLV OF DOWN DIRECTION LABEL REQUEST MESSAGE
S465
REQUEST LSP SETUP FROM LSP SETUP ACCEPTING PORTION 10
S470
END

FIG.15

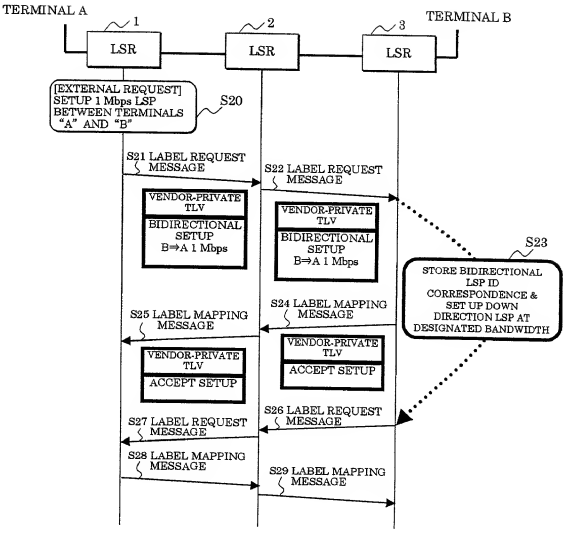
TERMINAL A
1
LSR
2
LSR
3
LSR
TERMINAL B
[EXTERNAL REQUEST]
SETUP 1 Mbps LSP
BETWEEN TERMINALS
"A" AND "B"
S20
S21 LABEL REQUEST MESSAGE
S22 LABEL REQUEST MESSAGE
VENDOR-PRIVATE TLV
BIDIRECTIONAL SETUP
B⇒A 1 Mbps
VENDOR-PRIVATE TLV
BIDIRECTIONAL SETUP
B⇒A 1 Mbps
S23
STORE BIDIRECTIONAL LSP ID CORRESPONDENCE & SET UP DOWN DIRECTION LSP AT DESIGNATED BANDWIDTH
S24 LABEL MAPPING MESSAGE
S25 LABEL MAPPING MESSAGE
VENDOR-PRIVATE TLV
ACCEPT SETUP
VENDOR-PRIVATE TLV
ACCEPT SETUP
S26 LABEL REQUEST MESSAGE
S27 LABEL REQUEST MESSAGE
S28 LABEL MAPPING MESSAGE
S29 LABEL MAPPING MESSAGE

FIG.16

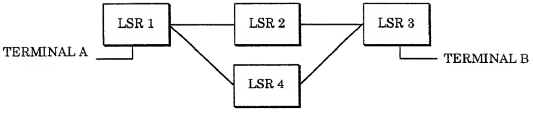
LSR 1
LSR 2
LSR 3
LSR 4
TERMINAL A
TERMINAL B

FIG.17

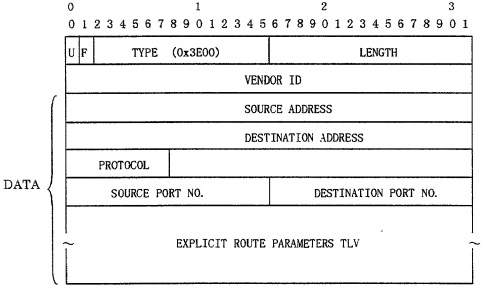
0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
U
F
TYPE (0x3E00)
LENGTH
VENDOR ID
SOURCE ADDRESS
DESTINATION ADDRESS
PROTOCOL
SOURCE PORT NO.
DESTINATION PORT NO.
DATA
EXPLICIT ROUTE PARAMETERS TLV

FIG.18

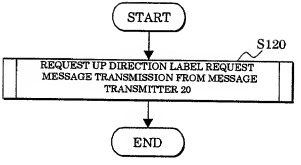
START
S120
REQUEST UP DIRECTION LABEL REQUEST MESSAGE TRANSMISSION FROM MESSAGE TRANSMITTER 20
END

FIG.19

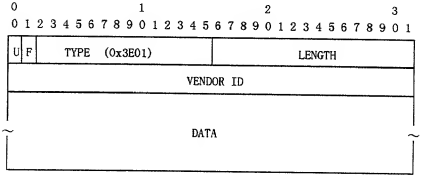
0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
U
F
TYPE (0x3E01)
LENGTH
VENDOR ID
DATA

FIG.20

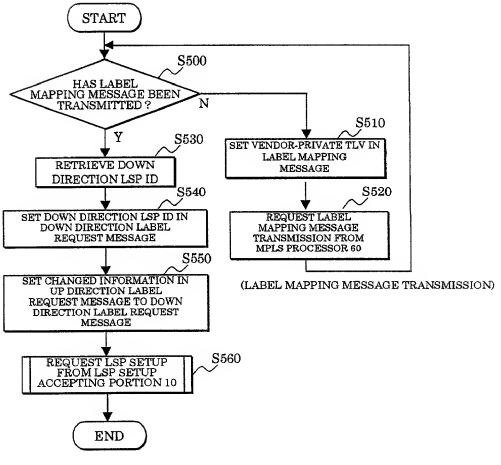
START
S500
HAS LABEL MAPPING MESSAGE BEEN TRANSMITTED ?
N
Y
S510
SET VENDOR-PRIVATE TLV IN LABEL MAPPING MESSAGE
S520
REQUEST LABEL MAPPING MESSAGE TRANSMISSION FROM MPLS PROCESSOR 60
(LABEL MAPPING MESSAGE TRANSMISSION)
S530
RETRIEVE DOWN DIRECTION LSP ID
S540
SET DOWN DIRECTION LSP ID IN DOWN DIRECTION LABEL REQUEST MESSAGE
S550
SET CHANGED INFORMATION IN UP DIRECTION LABEL REQUEST MESSAGE TO DOWN DIRECTION LABEL REQUEST MESSAGE
S560
REQUEST LSP SETUP FROM LSP SETUP ACCEPTING PORTION 10
END

FIG.21

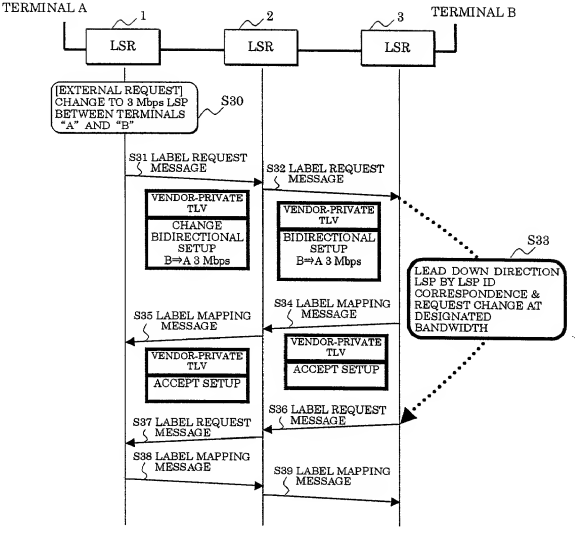
TERMINAL A
1
LSR
2
LSR
3
LSR
TERMINAL B
[EXTERNAL REQUEST]
CHANGE TO 3 Mbps LSP
BETWEEN TERMINALS
"A" AND "B"
S30
S31 LABEL REQUEST MESSAGE
VENDOR-PRIVATE TLV
CHANGE BIDIRECTIONAL SETUP
B⇒A 3 Mbps
S32 LABEL REQUEST MESSAGE
VENDOR-PRIVATE TLV
BIDIRECTIONAL SETUP
B⇒A 3 Mbps
S33
LEAD DOWN DIRECTION LSP BY LSP ID CORRESPONDENCE & REQUEST CHANGE AT DESIGNATED BANDWIDTH
S34 LABEL MAPPING MESSAGE
VENDOR-PRIVATE TLV
ACCEPT SETUP
S35 LABEL MAPPING MESSAGE
VENDOR-PRIVATE TLV
ACCEPT SETUP
S36 LABEL REQUEST MESSAGE
S37 LABEL REQUEST MESSAGE
S38 LABEL MAPPING MESSAGE
S39 LABEL MAPPING MESSAGE

FIG.22

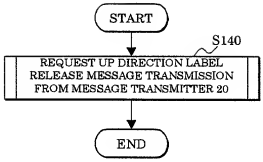

FIG.23

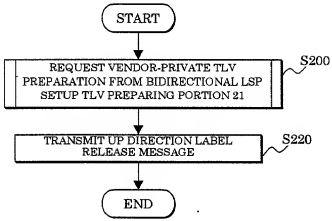

FIG.24

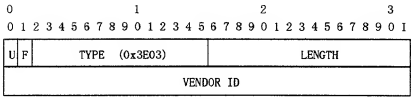

FIG.25

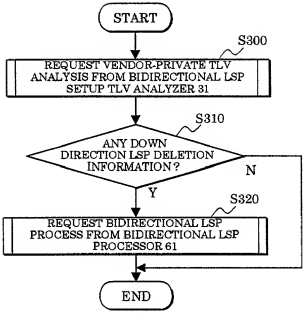
START
S300
REQUEST VENDOR-PRIVATE TLV ANALYSIS FROM BIDIRECTIONAL LSP SETUP TLV ANALYZER 31
S310
ANY DOWN DIRECTION LSP DELETION INFORMATION?
N
Y
S320
REQUEST BIDIRECTIONAL LSP PROCESS FROM BIDIRECTIONAL LSP PROCESSOR 61
END

FIG.26

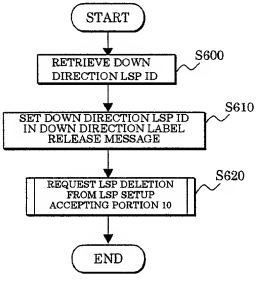
START
RETRIEVE DOWN DIRECTION LSP ID
S600
SET DOWN DIRECTION LSP ID IN DOWN DIRECTION LABEL RELEASE MESSAGE
S610
REQUEST LSP DELETION FROM LSP SETUP ACCEPTING PORTION 10
S620
END

FIG.27

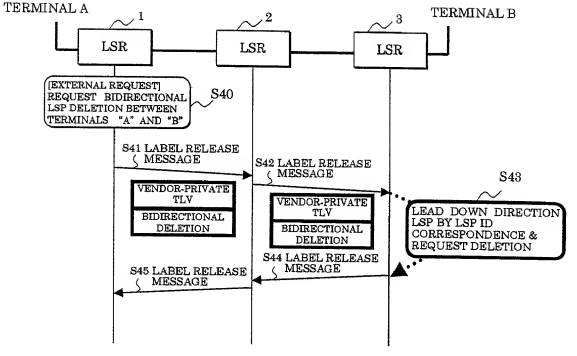
TERMINAL A
1
LSR
2
LSR
3
LSR
TERMINAL B
[EXTERNAL REQUEST]
REQUEST BIDIRECTIONAL
LSP DELETION BETWEEN
TERMINALS "A" AND "B"
S40
S41 LABEL RELEASE
MESSAGE
S42 LABEL RELEASE
MESSAGE
S43
VENDOR-PRIVATE
TLV
BIDIRECTIONAL
DELETION
VENDOR-PRIVATE
TLV
BIDIRECTIONAL
DELETION
LEAD DOWN DIRECTION
LSP BY LSP ID
CORRESPONDENCE &
REQUEST DELETION
S44 LABEL RELEASE
MESSAGE
S45 LABEL RELEASE
MESSAGE

FIG.28

PRIOR ART

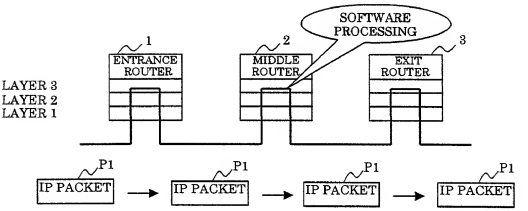

FIG.29

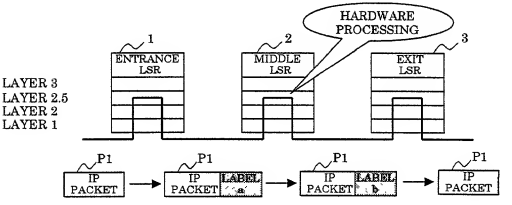

FIG.30

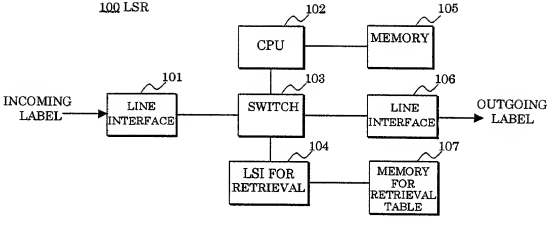

FIG.31

PRIOR ART

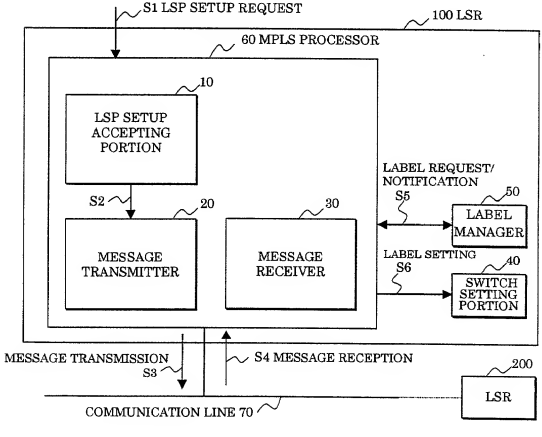

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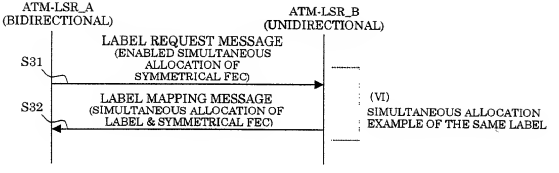
FIG.32



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